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A NEW THEORY OF ACUTE and SLOW Continu'd FEVERS;

WHEREIN,
Beſides their Appearances and Manner
of Cure, occaſionally, the true Structure of the *Glands*, the Manner, and
Laws of *Secretion*, the Operation of
Vomative, *Purgative*, and *Mercurial*
Medicines, are Mechanically Explain'd.

TOGETHER
With the Application of the General Propoſition to HECTICK FEVERS.

nd a General Method, for examining the Quantity of the Augmentation, or Diminution of the
Maſs of the *Blood*, ariſing from an *Obſtruction*
or *Dilatation* of the *Conduits* of *Secretion*, and an
Illuſtration of the the ſame, from ſeveral particular Obſervations.

To which is Perfix'd,
n ESSAY Concerning the Improvements of
The THEORY of MEDECINE.

The Second Edition, with many Additions.

——— *Si propius ſtes*
Te capiet magis. ——— Horat. De Arte Poet.

ndon, Printed for *Geo. Strahan*, at the *Golden-Ball* over
againſt the *Royal Exchange* in *Cornhil*, in the Year 1702.

MVSEVM
BRITAN
NICVM

THE PREFACE.

T*O write any thing tolerable about* Fevers, *or any thing worſe than what has already been advanced by ſome one or other on the Head, is perhaps no eaſie matter: The Ridiculous manner of accounting for their Cauſes and Symptoms, uſed by ſome Pretenders to* Medicine *and* Philoſophy, *has perhaps contributed (in it's way) to that contempt, to which (with ſuch Expence of* Satyr *and* Wit*) they and their Art have been expoſ'd.*

I have not the Arrogance to think the few following Sheets, will conduce *any thing to wipe it off; But of this I'm ſure, if this* Theory *prove Falſe, the choices behind are fewer by one, and that too by one, of the true Kind, which endeavours to account for their Appearances from* Mechanick *Principles.*

The Wiſer part of Mankind are now perſwaded, That this Machine We carry about is nothing but an Infinity of Branching and Winding Canals, fill'd with Liquors of different Natures, *and I am mightily out in my Conjectures, if for the Future any be hear'd about* Theories of Diſeaſes, *or the manner of the Operation of Medicines, who do not reaſon from theſe* Data, *& their neceſſary Conſequences. And ſeing* Continu'd Fevers *are only a Complication of Symptoms which naturally follow upon a general Obſtruction of theſe Canals (or the* Glands *which they conſtitute) and the neceſſary Effects thereof, as I reckon;*

none, I hope, will be angry I have call'd ſuch a manner of Accounting for them New, ſeing for any thing I know (as to the main thereof) it is really ſo.

For the ſtructure of the Glands, and the buſineſs of Secretion, the Found is Bellini's, but I hope it has loſt nothing in my hands. I have added ſomethings, extended others, and made all plain & conſequential.

As to the other things here occaſionally explain'd (which (adding what Bellini has adduc'd about Blood Letting) make up the great and principal Operations, perform'd by Medicines on Animal Bodies) I have very frankly borrowed what of them I found for my purpoſe, from Borelli, the foreſaid Bellini, and another Gentleman whom I reckon the Ornament of his Profeſſion and Our Countrey. But for the moſt part, pointing at Place and Perſon. And I ſhall reckon my ſelf no more a Plagiary for this, *than a Lawyer is to be accounted one for quoting his* Code *or* Pandects.

The occaſion of entering upon theſe thoughts, was the noiſe and buſtle has been made among us about Vomiting in Fevers*, about a Year ago: I Endeavour'd to ſatisfie my ſelf ſo as you may ſee, and had the Vanity to think there might be ſome as great Fools as I, If I be miſtaken it's not the firſt time.*

I have not been over nice in rangeing the Particulars *here contain'd, thoſe who read the whole will ſee their dependence, and for others I was not at the pains to lay in.*

The Language is juſt what moſt eaſily dropt from my Pen at firſt writing, the Roughneſs *of ſome terms of Art I cou'd not avoid, and the purity of the* Engliſh *Tongue is neither the growth of our Country, nor of my occaſions, if it be intelligible it is all (and perhaps ſome may ſay more than) I deſign'd.*

I neither expect nor deſire any reputation from theſe Papers, for I ſufficiently know how few ſuch things oblige. Beſides I'm dreadfully afraid few will Read them, and not over many underſtand them, for want of the neceſſary Qualifications of a moderate attention and a ſmatering of the Mathematicks. The firſt is abſolutely neceſſary, but for the latter they may e'en have a ſtrong Faith, tho' both for them and me I cou'd wiſh it were joyn'd with knowledge.

As for Cenſure, I am in no great dread of it; For I ſhall ly Secure (becauſe conceal'd) and ſee it's adverſaries (if it have the honour to provoke any) ſhoot a rover: If any ſhall take the pains to confute what I have here advanc'd, he may do it very ſafely for his humble ſervant, If he bungle it he'll do me an honour, by ſhewing is is not ſuch as ev'ry Body is able to diſprove: If he do it to purpoſe *he'll do me a kindneſs, by freeing me from my errors. I deſign for the future to medle no more with it, than if it had dropt from the Clouds.*

In fine, all my preſent concern is for the Book-Seller; If he ben't a loſer, (which misfortune wou'd be the moſt effectual confutation) it is indifferent to me, whether it periſh by a particular or the general conflagration.

ADVERTISEMENT.

I have here mark'd only the Errata which will mar the Senſe, begging the Reader to amend them with his Pen e're he begin the Book: For I hope theſe of miſ-pointing or miſ-ſpeling will ſtop none.

Page 9. Line 3. for *a-b* $13\frac{1}{3}$ Read $a-b = 13\frac{1}{3}$ P. 18. L. 19. *for* their, *read* theſe; P. 23, L. 19. *for* Senſible Perſpirations, *read* Senſible Evacuations; Page 24, L. 16. *for* Quantity, *read* Quality; P. 34. L. 2 & 3. *for* Theſe then, what, *read* theſe then, with what; *Ibid.* Line 9, *dele* occaſion'd by Intemperance; P. 40. L. 7 & 8. *for* as the Celerities reciprocally, and the Orifices directly, *read* as the Celerities and the Orifices conjunctly. Page 42. L. 4. *dele* be. P. 81. L. 21. *dele* the. Page 65. L. 10. *for* 900000 *read* 90000. P. 96. L. *penult*, for *is* read *are*.

AN ESSAY
Concerning the
IMPROVEMENTS
OF THE
THEORY of MEDICINE.

THERE are none of the Liberal Arts more neceſſary or uſeful to Mankind than *Medicine*, and yet, by what ill Fate I cannot tell, there is not one of them which is not brought nearer Perfection than it: The Inſtitutions of the moſt of the reſt, are reckoned neceſſary Qualifications for a *Gentleman*; but few ſtudy *Medicine*, ſave thoſe who deſign to live by the Practiſe thereof. How to account for this, is no eaſie Matter, unleſs we ſay (what is true) that for the moſt part it has been hitherto ſo ſcurvily treated, the Grounds of its Theory, and conſequently of the Practiſe built thereon, made ſo precarious, abſurd, and often contradictory, that Men (no otherwiſe oblig'd thereto) were loth to lay out their Time and Pains on ſuch Uncertainties. They ſaw many Practitioners rather *Empiricks* than *Phyſicians*, who preſcrib'd ſuch Remedies as they read or heard had been ſucceſsful in Caſes which they imagin'd like that of their Patients, but knew nothing either of the Cauſe of the Diſtemper, or of the Reaſon of the Cure.

It is true indeed, it is ſo very hard to obtain any tolerable Knowledge of the Hiſtory of Nature, and of the Springs of Life, of the Vertues of Medicines, and the Texture of the Animal Body; the Manner of the Operation of the former, and the Laws of the Motions of the latter, that this may be one very good Reaſon why Medicine has not not been farther advanc'd. Yet, notwithſtandwithſtanding of all theſe, had the genuine and true Method of obtaining theſe Things been conſtantly and vigorouſly purſu'd, but half the Time of what has paſs'd ſince *Medicine* firſt came to be cultivated, it had made another Appearance than it does at this Day. If Four thouſand Years ago, when Men ſaw the glorious Body of the Sun riſe ſometimes in one Place, and ſometimes in another, and ſet with the like Variety: At one Seaſon juſt peep up, and then down again, at another ſtay a long time with us; in one Place never diſappear, at another never be ſeen for a conſiderable Period; and at a third, ſtay and go at equal Diſtances of Time: When they ſaw the Brightneſs of a Summer's Noon-tide, all of a ſudden, turn'd into the palpable Darkneſs of a Winter's Midnight, without knowing any Reaſon for the ſame: When they ſaw the Moon appear ſometimes in one Figure, ſometimes in another; riſe here to Day, there a few Days after, and a ſhort time after this, no where at all; at one Seaſon all clear, the next Minute all over dark, now ſtand, then go, now before the Sun, then behind him, now near him, then far from him, with a thouſand other Varieties: When they ſaw all the Changes, Viciſſitudes, and various Poſitions of the Planets, the Uncertainties of the Tides, and the numberleſs Number and Order of the fix'd Stars; I ſay, then, when they only ſaw, and knew nothing more about theſe, if any had ſaid that all theſe infinite Varieties might be reduc'd to Rule and Order, that we might come to underſtand the Laws of their Motions, and the Nature of their Orbits, their Poſitions, Appearances, and Diſtances from us, and one another; that we might come to predict their Settings and Riſings, their Stations and Retrogradations, their full and partial Appearances, and their complete and incomplete Diſappearances, and that too almoſt to the greateſt Preciſion we are capable to diſtinguiſh or apprehend. But (which is the utmoſt Perfection of theſe things) if any had ſaid we ſhould at laſt come to underſtand the Reaſon and Cauſe of theſe various Motions and Appearances, he wou'd have ſcarcely been believ'd. And yet we know all theſe things have come to paſs in our

Days, and that, only by purſuing a true Method, every one improving upon the Obſervation of his Predeceſſor, till all the *Phænomena* were compleatly gathered, and then applying the Science of Quantity, (*i. e.* Geometry and Numbers) to inveſtigate their Orbits, their Diſtances, the Laws of their Motions, their Natures, and their Cauſes; by ſuch Means as theſe, Men have brought *Aſtronomy* almoſt to the higheſt Pinacle of Perfection. Now if *Medicine* had been thus treated (as it ought to have been) but half the Time which has paſs'd, ſince it came firſt to be cultivated, I can boldly affirm, if it had not been brought to Certainty and Demonſtration, yet it had been above the Contempt and Reproaches which are now daily thrown upon it, and had not been the common Theme of the loweſt Pretenders to Satyr and Wit.

Whatever be the Principle of Perception in Human, or of Senſation in Brute Animals, yet it is allow'd by all Sects of *Philoſophers* and *Phyſicians*, that all the Diſtempers and Diſorders of the Body of both, are owing to a Vitiation of the Quantity, Quality, or Motion of the Fluids, or to a bad Diſpoſition and Texture, a Diſtortion, Diſtention, Luxation, or Dilaceration of their Conduits, and the other ſolid Parts of their Bodies; and that Medicines operate by the Application and Mixtion of their Juices, or by a Communication of their Virtues to theſe. And ſeeing all theſe are the Modifications and Qualities of material Beings, which have the Dimenſions of Bodies, and are therefore *Quanta*, it neceſſarily follows, that the only Method of examining the Effects and Cauſes of theſe Qualities, is by applying to them the Doctrine of Quantity, *i. e.* Geometry and Numbers; and it is altogether unaccountable, how the World has not been ſufficiently aware of this till within theſe few Years.

The Ancients indeed have given us many Noble Remedies for ſeveral Diſtempers, many ſound Advices about the Management of the Patient, and for the Diſcovery of the Names (not the Natures) of the moſt of Diſeaſes, by telling us what Antecedents, Conſequents, and Concomitants were affix'd to ſuch a Diſtemper, which they call'd by ſuch a Name. In a word, they have done tolerably as to the Practical Part; tho', after all, many of their Receipts and Remedies ſeem very little to us now: For ſuch is the Intemperance, Indiſcretion and Lewdneſs (to which, either Perſonal or Tranſmitted, I wou'd aſcribe many of our Maladies) of our Days, that we are in compleat Poſſeſſion of all their Diſeaſes, heighten'd by as many Degrees of Malignity as there are Years betwixt us and them; and in the mean time we have begotten an infinite Variety of plaguy new ones, againſt which, moſt of their Remedies wou'd have leſs force, than the Children of our Age againſt the Giants of theirs. However, Practiſe was the only part of Medicine they can be ſaid to have any whit improven. For *Theory*: As their Philoſophy was not tolerable, ſo their Anatomy was little better, and their Natural Hiſtory worſt of all, inſomuch that they were almoſt deſtitute of the neceſſary *Præcognita* thereto. It is true, they all requir'd, in a Student of Medicine, a Knowledge in Geometry and Numbers; and thought it indiſpenſably neceſſary, to any one who ſhou'd offer to diſpence a Drugg, adjuſt a Compoſition,

tion, or give an Account of the Manner of the Operation of Medicaments; yea, ſometimes we have a few Hints of the Application of theſe in ſome Caſes: Yet, it cannot be deny'd, they made leſs Uſe of it than they might and ſhou'd have done, to the great Detriment of Medicine, as it is a *Science.* An evident Inſtance of this, is the Circulation of the Blood, which, if they had but very little conſidered the Laws of Motion, and the Elements of Geometry, they cou'd not have been ignorant of, as certainly all that are not bigotted muſt acknowledge they were.

Thoſe betwixt the Ancients and them of theſe two laſt Centuries, treated Medicine as all other Sciences were then uſed: They tranſlated, commented, and borrowed from the Ancients, and one another, made a great Pother about Words, and Tropes, and Metaphors, but, for the moſt part, left the Science in no better State than they found it. It is true, there have been ſome great Men, in all Ages, who have managed their Provinces with Skill and Addreſs: But it is certain, that Part of Medicine we are now enquiring into, receiv'd but few Improvements in thoſe Days.

After the Time of the Reſtauration of Letters, *Medicine* advanc'd proportionally with other Sciences; Anatomy was enquir'd into with good Succeſs by ſome, the Hiſtory of Nature, Philoſophy, and Chymy, by others; ſo that, e're this time, the Theorick Part of *Medicine* had arriv'd to a conſiderable Perfection, had not theſe two laſt, miſapply'd, ſtep'd in to hinder the ſame.

The *Philoſophick Phyſicians* were ſo fond of their Syſtems, that every Medical Appearance muſt do them Homage: All was reſolv'd into ſubſtantial Forms, Sympathies, and Antipathies, *&c.* or into ſubtile Æther, Congruities, and Incongruities, *&c.* wou'd they, nill'd they, not conſidering that the firſt of theſe is meer Metaphor, *i.e.* in the preſent Caſe, Words without a diſtinct Meaning, and that the ſecond is plain Nonſence, unleſs theſe things naturally follow from the determin'd Laws of Motion; and, in a word, that all Natural Philoſophy, unleſs ſupported by Geometry, is but a pleaſant *Romance*.

The *Chymical Phyſicians* were yet more wild to introduce their *Laboratories* into the Bodies of Animals, and to expect the ſame Effects from our Veſſels as from their Retorts. Some of them have reſolv'd the Cauſes of all Diſeaſes into Acids, and therefore they muſt be cured by Alcalious Remedies: Others, by an oppoſite Extreme, have reſolv'd Diſeaſes into theſe, and therefore they muſt be cur'd by thoſe. They have made a great Noiſe with their Fermentations, Effervescences, and the like; while, in the mean time, we are certain that neither the one nor the other is in the right, and that the Heat of our Bodies is no wiſe able to produce the ſame Effects with their Furnaces, neither are we able to mix three or four different Liquors in a fine Glaſs Tube, much leſs can we expect ſuch Effects as they aſcribe to their Fermentations from the much more ſlender Canals of Animal Bodies. I ſhall not offer at a formal Confutation of theſe different Ætiologiſts, the Matter has been done, or will be done, by much better Pens; but this in the General I may ſay, That allowing theſe Gentlemen all they crave, yet ſtill all is Nonſenſe, unleſs they firſt ſhew their Syſtems and Chymical Effects to be neceſſary Corollaries from the known Laws of Motion, *i. e.* unleſs all their Philoſophy, and Chymiſtry too, be firſt mechanically explain'd, which moſt of theſe Gentlemen do not pretend to.

Gallileo, *Torricelli*, and *Paſchal*, the the firſt by Water, the other by Mercury, and the third from the Effects of one and the ſame Experiment, at different Heights, brought to light theſe three grand Properties of the Air, (that Fluid which is ſo abſolutely neceſſary, and ſo univerſally uſeful, both to the Being and Operations of Animals and Vegetables) to wit, its Elaſticity, Gravity, and circumambient Preſſure, which have ſerv'd in great ſtead toward the Mechanical Explication of the Animal Oeconomy. *Snellius* firſt found out the true Meaſure of the Refractions of Light, which ſerves to explain the Phænomena of Viſion: And ſeveral have ſhewn the Analogy betwixt the Motions of Muſical Organs, and their Effects on the ambient Fluid, and the Vibrations of a Pendulum, whereby the Diverſities of

Sound, and the Manner of Hearing, are explain'd.

Des Cartes, by a bold (not to ſay impious) Attempt, was the firſt (ſince *Prometheus* and *Democritus*'s days) who endeavoured to create an Animal, *Magnis tamen excidit auſis*. But to be juſt to him, he was no mean Perſon; for, not to ſpeak of the Analytical and Geeometrical Improvements, which are acknowledg'd to be his (ſuch are the Solution of Biquadratick Æquations, the Analytical Inveſtigation of all *Loca*, the Expreſſion of the Natures of Curves by Æquations, which renders them ſo manageable; The Geometrical Conſtruction of Æquations of all degrees, the Determination of the Curves of Reflexion and Refraction (which had perfected Optical Machines as to the Theory, had not a wonderful Property of Light ſince diſcovered, come croſs to it) the manner of the Inveſtigation of which Three, the greateſt Men of this, or any other Age, have lately thought it worth their pains to ſhew: But above all, the Invention of a Method of Tangents, which was unknown to the World before; and how comprehenſive the ſame Method is, *Hudde*,

Hudde, and *L'Hoſpital*, have ſhewn, I ſay, beſide all theſe) it was he who firſt baniſh'd effectually the *Ariſtotelian* Jargon, and made men reflect upon the natural right they had to a Freedom of Thinking: And tho' for the moſt part he did ſubſtitute a bad Syſtem in its room, yet it was ſuch an one as made men reflect more upon the Neceſſity of applying Geometry to Natural Philoſophy; but which is moſt for our preſent Purpoſe, he was the firſt who explain'd Mechanically, the Nature of Viſion, and the Conſtruction of the Eye: He has likewiſe giv'n ſeveral conſiderable Hints towards the better Underſtanding of the nature of Sound, how it acts on our Organs, and raiſes the ſeveral Paſſions, both in his other Works, and in his *Compendium* of Muſick; and tho' this laſt Treatiſe be unlick'd and unſhap'd, and never deſign'd for the Publick, as himſelf ſays, yet it has ſome ſew uncommon Touches not unworthy its Author.

But all hitherto done, was only pickering, or rather ſtorming the Outworks of *Theory* of *Medicine*; the Fort was ſafe and intire, till the Noble *Harvey* gave it a fatal Shock in the Diſcovery of the *Circulation* of the *Blood*; a Diſcovery ſo wonderful, uſeful and happy, that all Ages will admire and bleſs its Author; a Diſcovery ſo conform to the Rules of Mechaniſm, and the Laws of Motion, and ſo fitted to that Geometry, the wiſe Director of Nature uſes in all his Wonderful Works; in a word, a Diſcovery, which has let in more Light into the *Theory* of *Medicine*, than almoſt all the former join'd together.

About this time, *Steno* endeavoured to give an Account of the true Structure of uncompounded *Muſcles*, and to explain mechanically, the manner of their Operation: And tho' he was miſtaken in both, yet by this Attempt, he reduc'd the Choices behind into a leſſer Number, and encreas'd men's Deſires to ſearch into the true Mechaniſm of theſe Wonders of Nature. He likewiſe publiſh'd a Treatiſe, *De Solido-intra Solidum*, wherein, beſides ſeveral uſeful things in Natural Philoſophy, there are ſome which have been ſince happily apply'd to that Part of *Medicine* we are now enquiring into.

Sanctorius likewiſe, in his admirable Treatiſe of *Statical Medicine*, has obliged the World with many excellent Rules of Health, and many uſeful Obſervations of the Quantities and Proportions of the ſeveral Natural *Evacuations*, and the Effects of the Suppreſſions of theſe, whereby men are enabled to talk more diſtinctly, and not left to gueſs at random about ſuch things. It is to him likewiſe, we owe the Invention of what is now call'd the *Thermometer*, whereby we are not only enabled to diſtinguiſh the ſeveral Degrees of Heat and Cold, to a much greater Exactneſs than formerly, by our bare Senſes, but likewiſe to prognoſticate ſomething about the Changes of the Weather; but which is moſt of all, we are thereby enabled to underſtand ſomething more than formerly, about the Cauſe of the unnatural Aſcent of the nutricious Juices in Plants and Vegetables.

At laſt came out that ſurprizing Piece of *Borelli's De Motu Animalium*, giving the true Mechaniſm of the external Motions of Animals, and forward Advances in that of the internal Motions: For him was reſerv'd the great Honour of augmenting the Number of Sciences by one; one, the nobleſt and moſt admirable that ever Humane Wit invented! For, by a vaſt Skill in Mechanicks, and a wonderful happy Subtilty of Genius, he not only invented, but himſelf alone, almoſt perfected that Science; a piece of good Fortune, which ſeldom ever happened to one and the ſame Perſon. His firſt Part of the external Motions is perfectly charming, inſomuch, that nothing fuller and more compleat can be deſir'd on the Head. It is true, the moſt Ingenious *John Bernoulli*, the worthy Profeſſor of Mathematicks at *Groningen*, (from a Property of Fluids, and a Method of Inveſtigation, which was not known to *Borelli*) has giv'n the Grounds of a much exacter Calculation of the Elevation of the *Pondera* from their giv'n Reſiſtances, and the Dilatations of the *Machinulæ* which conſtitute the diſtractile *Fibres* of the *Muſcles*, than *Borelli*'s, in the 98th Propoſition of his firſt Part; and has likewiſe drawn many ingenious Corollaries from that Speculation, determining the Curve theſe *Machinulæ* would deſcribe, by a Section through their Direction, and the Proportions of the *Liquidum Nervorum*, or, as he calls it, the *Aura motiva* to the

Pondera elevanda. But it muſt be granted, *Borelli* has made the beſt uſe of all the Geometry known in his Days, of any who went before him. In his ſecond Part, he has many admirable Propoſitions for calculating the Force of the Heart, and the *Impetus* which the Arterial Blood receives from it, the determining the Neceſſity of its giv'n Structure, the manner, nature, and uſe of Reſpiration; beſides many uſeful Hints for the Diſcovery of the Motions and Natures of the Fluids of the Body. But it muſt be confeſs'd, this Part is not near ſo compleat as the other: Some of the Motions of the Fluids, and the Natures of the Canals, were things not manageable by his Geometry; and he neither had ſo perfect a Skill in the *Practical* Part of *Medicine*, nor was Anatomy ſo fully diſcover'd as now, to compleat that Part.

His noble Diſciple *Bellini*, has taken up the Science where he left it. He, by an exact Skill in Anatomy, a perfect Knowledge in the *Practial* Part of *Medicine*, a nice and true Obſervation of the leſs common Effects of Nature, and a good Underſtanding in the Mechanical

Philoſophy, has much improven that Part of the internal Motions of Animals: He has nicely diſtinguiſh'd the Natures and Differences of Urines and Pulſes: He has juſtly explain'd the Effects of Blood-letting in ſeveral ingenious Propoſitions: He has handled the general Cauſes and Diſtinctions of Fevers; the manner of the Operation of ſome Medicaments, the Diſeaſes of the Head and Breaſt, after a manner no leſs uncommon than genuine; whereby he has put a quite new, but natural Face on Medicine, and reduc'd it pretty near to a Science, which was before but a Trade. There are ſeveral uſeful and ingenious Propoſitions in his late Book, about the Motion of the Heart, the Blood, and the other Fluids; the manner how to diſcover the Tendency of the Fluid from the Figure of the Canal giv'n, a Confutation of the *Chymical* Fermentations in Secretion, and an Illuſtration of his former Treatiſe about Blood-letting. But, in my Opinion, the nobleſt and moſt admirably uſeful Part of his whole Works, is that about the true Structure of the *Glands*, and his Hints about the Laws and Manner of Secretion. It is a great Pity, that he has not, or will not, explain this more fully himſelf; for I reckon it, and the *Circulation* of the Blood, to be the Key, whereby the *Geometria recondita* will have Admittance into, and let in an *Ocean* of Light to theſe dark internal Regions.

Our Countryman, Doctor *Pitcairne*, has admirably illuſtrated this Part, ſo far as the Labour of conſtant Teaching in one Place, or the Hurry of a toilſome Practiſe in another cou'd allow. He has demonſtrated the genuine Nature of the *Circulation* of the Blood, by ſhewing the Neceſſity of the Continuity of the Veins to the Arteries: He has ſhewn the Mechanical Structure of the Lungs, and thence, the neceſſary Effects of Reſpiration: He has aſſign'd the Organs, their Force and Nature, and the true manner of Digeſtion, and freed us from the Fury of a corroding *Menſtruum*: He has demonſtrated the Neceſſity of Obſtructions rather happening in the Arteries than in the Nerves, and in the Nerves rather than Veins; and how theſe Obſtructions are produc'd: He has demonſtrated the Evacuations proper in

Fevers, and the Cauſe and Nature of the Diſeaſes of the Eye: He has baniſh'd effectually the plauſible Congruity of Pores in Secretion, the ridiculous Cant of Acids and Alcali's, and the whimſical Fancy of Ferments; beſides many other noble Hints, which his manly *Laconick* Eloquence has left undetail'd to the Sagacity of the attentive Reader.

Beſides all theſe, ſeveral Gentlemen of the *Royal Society* at *London*, (which did caſt the firſt Copy to the reſt of *Europe*) and of the *Royal Academy* of Sciences in *France*, and of ſeveral other Philoſophick Societies, have diſcover'd many uſeful Theorems, and made many Noble Experiments, toward the Illuſtration of the Mechanical *Theory* of *Medicine*, which are never ſufficiently to be admir'd or commended.

Theſe are the Men, and this is a ſhort Account of what they have done, ſo far as I know or remember, toward the *Theoretick* Part (at leaſt, toward what I think deſerves that Name) of Medicine. A great many Noble Things this way they have done, and many conſiderable Difficulties they have overcome: But it can not be deny'd, there ſtill remains an ample Field for the Induſtry of the preſent and future Ages. It wou'd ſuppoſe, that one knoweth (which God knows I do not) all that has been hitherto diſcover'd, and that he were almoſt able to ſupply the Remainder, to give a Particular Account of what is wanting in this Part: However, I ſhall venture to give my Opinion of ſome things which are evidently deficient.

I. Tho' I think the greater, and more eaſily conſpicuous Organs and Parts of Animals and Vegetables, be entirely diſcover'd by the Induſtry of ingenious Anatomiſts of our *Iſland*, and thoſe of other Countreys; yet I think we have not, as yet, ſo compleat an Inſpection into the more minute and leſs obvious Parts of theſe, which muſt be abſolutely neceſſary toward a compleat Theory of Medicine: We have not, as yet, trac'd the Continuation of the Arteries, Veins, and Nerves, ſo far as they go, nor ſo far as I hope they may be trac'd: We have not, as yet, a perfect Diſcovery of the Texture of the Brain in all its Parts: We have not, as yet, been able to evolve the compounding

Veſſels of any more Glands, than the Inteſtines and *Teſticuli*: We want the true Texture of the *Liver*, *Pancreas*, *Spleen*, *Kidneys*, and all the other Conglobolous and Conglomerate Glands: We have not diſcover'd the Texture and Range of the Veſſels under the *Cuticula*. But which is worſt of all, we have not, as yet, determin'd the true Situation, nor Poſition, the Windings and Branchings, the Angles they make with one another, or the Curves they deſcribe, of moſt of the known and viſible Canals, which might be eaſily done. The Anatomy of Human Bodies, is as yet very imperfect, and our *Comparative Anatomy* is quite lame: Beſides, a Thouſand other Things which might be here added, which are neceſſary to a true Theory; for unleſs our Theories and Obſervations confirm one another, they ſhall be ſtill little more than the moſt probable Conjectures. The Performances of *Malpighius*, Dr. *Grew*, *Lewenhoeck*, and others, as to this deficient Part, are very well; but ſtill there are here many things deſirable, which I hope are reſerv'd for ſome of theſe, or others, endu'd with a dextrous

Hand, a quick Sight and Obſervation, aſſiſted with fine Microſcopes, and a good Skill, both in the common and more abſtruſe Geometry.

II. We evidently want a Compleat *Hiſtory* of *Nature*; *i. e.* The Names and Natures, the Diſtinctions and Properties, of the Animal, Vegetable, and Mineral Kingdoms. It is true, much has been done already, and ſtill is a doing, this way, by the Noble Members of Philoſophick Societies, and other Private Perſons; yet ſtill very much is wanting. And till that Part of it, which is neceſſary in Medicine, (and how far that may extend none can tell) be perfected, we cannot expect a Compleat Theory thereof: For all know how uſeful, a perfect Skill in the Nature and Virtues of the Remedies, is, to the full underſtanding the Diſeaſe, and the manner of its Cure.

III. We want a Compleat Syſtem of Mechanick Philoſophy, *i. e.* an Account of all the viſible Effects of Nature upon Geometrick Principles; for it is not Syſtems, as they are an Explication of all the Effects of Nature from the ſame Principles which are ſo juſtly ridicul'd, but Syſtems, as they are ungeometrical. It is true indeed, all the great, viſible, conſtant and uniform *Phenomena* of Nature, have been attempted by the Eminent Mathematicians of this and the laſt Age, but accounted for, from rigorous Geometry, by that ſtupendiouſly Great Man, Mr. *Newton*, *Quem ſecula nulla tacebunt:* He has not only giv'n the true Cauſes of theſe *Grand Appearances*, the Laws of Motion, and the Nature of Fluids, the Nature of Light and Sound, the Manner and Rules of their Propagation; in a word, all the general Mathematical Principles, whereby to examine the Pretenſions of different Syſtems, and many new ſurprizing Problems and Theorems in the ſpeculative Part of Geometry; but he has likewiſe diſcover'd the true Principle of all the Effects of Nature, to wit, Attraction, or Gravitation: But, which is moſt of all, to him we owe the only Key, whereby the Secrets of Nature are unlock'd, to wit, the general Way of managing Æquations, the Methods of *Infinite Series's*, and of *Fluxions*, direct and inverſe; Examples of which, his whole *Principia* are. This is that which will bring *Analyticks*, *Geometry*, *Natural Philoſophy*, and the *Theory of Medicine*, to their utmoſt Perfection, if ever they get thither: By theſe we are able to contract all the Myſteries of the Ancient and Modern Geometers into the room of a few Lines, and diſcloſe them with a few Scrapes of our Pens; of which, when People ſee the Concluſions, without knowing theſe Methods, they look like Conjuring, or ſomething above the Capacity of Men. Yet, after all, theſe Methods have not as yet been apply'd to the leſſer, leſs obvious, leſs conſtant, and leſs uniform Effects of Nature, of which we are principally ſpeaking here, and which are ſo abſolutely neceſſary to a true Theory of Medicine: And tho' I am perſwaded, that from the ſame Principles the grand Appearances of Nature have been accounted for, theſe more minute ones may be ſo too; yet it is what has not been actually done, and without which we ſhall be ſtill ſtraitned in our Theories. We want to know the Mechanical Account of Chymical Operations, and Preparations of ſeveral ſorts; which is a vaſt Defect: We want to know ſomething more about the Nature of Fluidity, and what it is makes up the many Varieties and Differences of Fluids from one another; the Figures of their conſtituent Particles, and a compleat Collection of the Laws of their Motions: We want to know the true and adæquate Nature and Cauſe of Heat and Cold, and the Reaſon of their odd Effects: We know not the Figures of the Particles of Bodies which produce ſuch Varieties of Taſtes: We want to know the Figures of the Particles of Bodies which naturally form themſelves into ſuch and ſuch Shapes, after the manner *Hugens* has analyſ'd Iſland Cryſtal; this wou'd be of mighty uſe toward the full underſtanding of the Natures of all Saline Bodies, which generally form themſelves into determin'd Figures: We do not, as yet, underſtand the Principles of *Individuation* (if I may ſo call it) of one kind of Body from another; Why ſome have ſuch Grains, Colours, and Shapes, others different: We know not the true Nature and Cauſe of *Elaſticity*, which is of ſo great Extent in the Animal Oeconomy: We want to know a great deal more about

Light and Colours, Opacity and Tranſparency, tho' we hope to receive Satisfaction therein ſhortly from that Great Perſon who has ſo dearly obliged the World already. Theſe, and a Thouſand other Things, we want, which he only can enumerate, who cou'd ſupply them: And tho' we have many and noble Hints in moſt of theſe, from *Borelli*, Mr. *Newton*, and ſome other Mathematicians, yet we have not ſo perfect a Knowledge of them as might be deſir'd, and, as I hope, may ſome Day or other be obtain'd.

IV. Laſtly, We want a *Principia Medicinæ Theoreticæ Mathematicæ*: Albeit the Theory of Medicine and Natural Phyloſophy be nearly ally'd, and tho' the lately mention'd Great Man has almoſt compleated the latter, yet he did it not with that View to be mainly ſubſervient to the former: And tho' *Borelli*, in his excellent Book, *De vi Percuſſionis, & de Motu Natur. a Gravitate factis*, has demonſtrated ſeveral things uſeful to that Purpoſe, yet he concern'd himſelf mainly, but with thoſe things which he thought neceſſary to the underſtanding of his Book, *De Motu Animalium*: So that, notwithſtanding of both theſe, we have not ſuch a Book as I reckon this ſhou'd be. Such a Book (among many other things which I am not capable to enumerate) ſhou'd at leaſt contain theſe things: 1. It ſhou'd contain the true Nature of Fluidity, wherein it conſiſts, and what it is that makes one Fluid differ from another, the Figures of their conſtituent Particles, and why there are Solids of ſuch and ſuch determin'd Shapes naturally generated in each particular Fluid; the general Laws of the Motions of all Fluids, and the particular ones of each different kind, whether homogeneous and uniform, or a Mixture of ſeveral different kinds. 2. It ſhou'd contain the Nature and Cauſe of Elaſticity, and the Figure of the conſtituent Particles of Elaſtick Bodies, and the Laws of the Percuſſions and Reflexions of ſuch; the Curve, into which Elaſtick Bodies naturally form themſelves, when bended, if they obſerve one conſtant Law, *i. e.* if the Tenſion be always proportional to the bending Force; or the ſeveral Curves they muſt deſcribe, if different Elaſtick Bodies obſerve different Proportions, (as *James Bernoulli* has done) which wou'd be infinitely uſeful in the Theory of Medicine. 3. Since it is certain now, that Glands are nothing but a Complication and Circumvolution of the Arteries into Curves of ſuch and ſuch Natures and Numbers, or into *Plicæ*, whoſe Turnings are Curves, or make right-lin'd Angles of ſuch and ſuch Quantities: Such a Book ought to determine the Effects ariſing in the Fluids, as to the Acceleration or Retardation of their Motion, their Viſcidity or Fluidity, the Comminution or Augmentation of their Conſtituent Particles, when mov'd in Canals turn'd and complicated into all poſſible curve or right-lin'd Figures; and what Effects wou'd ariſe in the curv'd Canals themſelves, as to their Elaſticity or Diſtractility, in being turn'd into ſuch and ſuch Curves. I imagine it is ſome ſuch thing as this, which *Gulielmini* promiſes in the Preface of his Treatiſe, *De Aquarum fluentium menſura*; for we know the Laws of the Motions of Fluids in direct Canals, already. This wou'd be a Work of vaſt Labour, but of noble Uſe; and we know not but general Methods might be fall'n upon to alleviate the Labour of the Calculations. Mr. *Newton* has giv'n one Theorem in two Lines, which, if rightly manag'd, will give the Quadratures, Rectifications, Surfaces, Solidities, Centres of Gravity and Percuſſion, or Oſcillation of all imaginable Curves and Solids, whoſe Natures can be expreſs'd by any Analytical Æquation whatſoever. I know of ſomething like the ſame done for all Curves and Solids, whoſe Natures are expreſs'd by Tranſcendent or Exponential Æquations, *i. e.* ſuch as he calls *Geometricè Irrationales*: And perhaps both theſe laſt may be compounded into one, and conſequently comprehend the firſt likewiſe. Now if ſuch general Methods were fallen upon, for theſe which we are ſpeaking of, it wou'd ſave a great deal of Calculation, Reading, and Writing; and why it may not, I ſee no Reaſon to doubt. 4. It ought to contain a Calculation or Determination of what Effects the Fluids wou'd have upon one another, and upon Canals form'd into ſuch Curves, upon an Augmentation or Diminution of their Quantities, an Acceleration or Retardation of their

Motions, the Encreaſe or Diminution of their ſpecifick Gravities, or of the Bulk and Figure of their conſtituent Particles, or the Alteration of their Fluidities or Viſcidities. 5. It ſhou'd contain what Effects ſolid Particles of all Figures, Sizes, and different Gravities, mixt with Fluids of all kinds, wou'd have upon the Fluids themſelves, or upon the diſtractile Canals of ſuch and ſuch Figures. 6. Laſtly, it ought to contain the final Cauſes, and the Mechanical Neceſſity of the giv'n Figures of the more ſolid parts of the Body; Why ſome Glands are Conglobous, others Conglomerate, as they are call'd; Why the Teſticles reſemble a Spheroid, generated by the circumvolution of a Semi-ellipſis about its longeſt Axis; and the Heart, one generated by the circumvolution of a Semi-ellipſis about a Diameter oblique to its longeſt Axis, or at an Angle of 45 Degrees with the ſame. Why the Muſcles, ſome of them are of one Figure and Texture, ſome of them of another; ſome ſituate near the part to be mov'd, others at a greater diſtance from it. Now, tho' many of theſe things here mention'd, are to be found already accounted for, and demonſtrated in the Writings of the Geometers of this Age: Yet one who profeſſedly deſign'd to treat of theſe things for the benefit of Medicine, ſhou'd either Tranſcribe them out of theſe, or Demonſtrate them anew after his own Method, that we might have all that belongs to this Subject together in one Book.

But after all, perhaps it may be ſaid, ſuch a Chimerical Piece as this, toward which there are requir'd ſo many hard (not to ſay impoſſible) things, will never be written by all the Wit of Men. To this, I anſwer, That there are very great Advances toward ſuch a Piece already made, and if a few ingenious Men, endowed with a perfect skill in the Abſtract Geometry, and the new Methods of Inveſtigation, ſhou'd but manage this Province after the manner we formerly ſhew'd Aſtronomy had been treated, each improving the Diſcoveries of the other, the one beginning where the other had left off; I doubt not but theſe I have mention'd, and harder things too, might be brought to paſs: And if once ſuch a Book as this was finiſh'd, and the other neceſſary perquiſites ſearch'd into, Medicine in a ſhort time might be brought to the immediate Confines of Demonſtration.

There are two things, which wou'd mightily conduce toward the perfecting ſuch a Work as this of the *Principia Medicinæ Mathematica*. The firſt is, the publiſhing ſomething concerning the *Inverſe Method of Fluxions*, or as the *French* call it, *La Methode de Calcul integral*; which might contain the Application thereof to all the intricate Problems of Geometry, and give general Canons for the Solution of all ſuch, and likewiſe general Precepts for the Application of the ſame to Mechanick and Natural Philoſophy, with the Illuſtration of them by many particular Examples from Mr. *Newton*'s *Principia*, and the Noble Problems ſolv'd within theſe Dozen Years, and Publiſh'd in the *Philoſophick Tranſactions*, *Acta Lypſiæ*, and *Journal's des Scavans*. For tho' a man with a great deal of pains, may gather the Materials of ſuch a Book, from ſcraps here and there, yet there are few who have ſo much leiſure, or if they have, will give themſelves the trouble; or if they cou'd do both, have the convenience of ſearching into ſo many different Books, to gather up what is neceſſary to furniſh them with a tolerable knowledge of this wonderful Method: And therefore it would be of great Uſe to the World, and to the Improvement of Learning in general, That a Book, containing at leaſt all that is already publiſh'd on this Head, were compil'd and ſet in a clear Order. It is true, the Noble *Leibnitius* has promis'd ſuch a Book as this, but I am afraid his great Employment will deprive us too long of that Advantage; Beſides, I doubt he will not condeſcend to the Capacity of the lower rank of Geometers, for which ſuch a Book ſhou'd be princpally deſign'd. *Carre* indeed has giv'n the firſt Rudiments of ſuch a Work, but he is ſo far from giving an Account of all that is publiſh'd this way already, that I am afraid he has not underſtood them himſelf, his Performances on that Head being ſo very low. A Second thing, which wou'd very much conduce toward the Work we were ſpeaking of, is, that the great Geometers of this preſent Age wou'd be pleas'd to publiſh thoſe many noble Secrets of Geometry and Philoſophy, which, to the great Detriment of Learning, they think fit to conceal; what Reaſons they have for doing ſo, they know beſt themſelves, but I am ſure it wou'd be a greater Honour done to themſelves, and a greater Advantage to the Age they live in, and in particular to the Mathematicks, to communicate to the publick, ſuch things as they know have not as yet been made common, than to keep up the Method, now in Vogue among ſome, of propoſing hard Problems, (which are at leaſt ſuppos'd, known by the propoſers,) to employ the time of others, which might be laid out on things as yet unknown: This wou'd put an end to the Contentions about the Honour of Inventions, and prevent the melancholly Diſappointment ariſing from finding out excellent things, and yet not to be reckon'd the Inventors of them. There could be no greater Encouragement for an ingenious man, than to be ſure he ſhould not beſtow his time in vain, if he were ſucceſsful in his Deſign; that is, to be ſure he is not already prevented.

Thus I have frankly given my haſty Thoughts, about things of very great importance: But I hope the candid Reader will more eaſily Pardon the many Eſcapes of this rude Draught of an Eſſay, for theſe reaſons. Firſt, that it was written in a Place deſtitute of all common Aſſiſtances and that I could be at no eaſe till it was done, the Bookſeller preſſing to have it without any Delay: And in the next place, that if ever I ſhall be betray'd into Publiſhing any thing again, it ſhall be on a Subject leſs obnoxious to wrangle, and where there is a ſurer guide than *Imagination*. For to deal freely with the Reader, it was out of meer Indignation that I put Pen to Paper on this Subject, having ſeen it ſo unskilfully manag'd by two of our own Phyſicians here in Town, who ſome time ago Play'd at *Loggerheads*, about Vomiting in Feavers. I owe them thanks, for the many good words, and a few good offices they have ineffectually endeavour'd to do for him whom they ſuſpected to be the Author (how far their kindneſs would have extended it ſelf toward him who's the Author, indeed had they known him, we may eaſily gueſs); however, all that I ſhall ſay of them, is, that the one (that Enemy to all Schemes, Figures, Senſe, and Demonſtrations) had a bad Cauſe, and defended it moſt wretchedly: And that the other, having imitated the practice of better Phyſicians, was not ſo happy as to Imitate their Reaſoning, but ſpoil'd a good cauſe by bad Arguments.

FINIS.